C-AD

Radiation

Safety

Committee

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Minutes of Radiation Safety Committee of November 1, 2004

Subject: Status of the A20 penetration and the Relocation of the AGS Shutter

Present: D. Beavis, W. MacKay, E. Lessard, A. Javidfar, L. Ahrens, P. Bergh, N. Williams, K. Yip, and J. Glenn

The purpose of the meeting was to review two items in the AGS before startup. The A20 penetration was previously reviewed (see RSC minutes of May 18, 2004). The purpose of this review on A20 was to take into consideration any changes in the status of the work for the cold snake penetration. The second item was review of the relocation of the AGS shutter and its use for low beam diagnostics.

The installation of the A20 penetration for the AGS cold snake is complete. However, work to install utilities into the penetration and around its exit on the AGS berm continues. K. Yip had done a calculation for the dose at the exit of the penetration when the penetration was fully loaded. He noted that the method of the calculation may have underestimated the dose and suggested that a factor of 3 be applied to the fault dose of 400 mrem/hr quoted in the previous minutes. Thus for 10**14 p/s at full energy gives 1200 mrem/hr. A. Javidfar reported that about have the materials (by mass) are in the penetration. The previous calculation by K. Yip demonstrated that the complete loading of the pipe reduced the dose (relative to empty) by about a factor of 10. Therefore, a factor of 2-4 needs to be applied to this number until the penetration work is complete. This provides an estimate of 2400-4800 mrem/hr for 10**14 p/s at 25.5 GeV.

The above estimate assumes that full energy beam can be faulted in one localized spot. This is not expected, but it is expected that the injected beam can be faulted in a local area. It should be kept in mind that we are dealing with maximum possible faults and not routine loss levels, which are many orders of magnitude below these numbers in most locations. J.W. Glenn has examined AGS fault studies no. 10 and 13 (see attachment1). These fault studies examined the dose rates outside existing penetrations of the AGS ring. These penetrations are typically 24-26 inches in diameter (A20 is 14 inches in diameter) and shorter. These penetrations are loaded with a substantial number of cables. The C18 penetration had 0.4 mrem/hr with the 1.9 GeV injected beam striking the C15 valve with 5.6*10**12 per 3.6 second cycle. The adjacent fan house had 60 mrem/hr. Scaling the C18 penetration to 10**14 p/s gives 64 mrem/hr. Scaling the A20 penetration to injection energy with E**.8 scaling gives 300-600 mrem/hr and about 150 mrem/hr when the A20 penetration is fully loaded.

The machine will begin operations with copper ions. The beam will be injected with an energy of 100 MeV per nucleon. The intensity is expected to be approximately 4*10**9 ions/5 second cycle. This corresponds to 1.4*10**14 nucleons per hour at 0.1 GeV. The 300-600 mrem/hr was calculated for 3.6*10**17 nucleons per hour at 1.9 GeV. Scaling to the copper intensity gives 0.1 to 0.2 mrem/hr. This number should be reduced for the lower injection energy. Scaling by E**.8 should be conservative for this energy range and provides an additional reduction of 10. Thus the expected scaled dose rate for maximum possible copper fault (routine cycle) is 0.01-0.02 mrem/hr. A fault study will be done to verify that the levels are low, but should not be extended too long to avoid other issues such a soil activation, component activation, etc.

The committee requested that TLDs be placed at the exit of this penetration and changed out weekly for the first few weeks of AGS operations to examine the chronic dose through the penetration. **(CK-AGS-FY2005-408).**

The Engineer needs to determine the amount of work that will be done near the penetration to determine if work planning or a radiation work permit needs to be issued for the work once the machine starts operation.

RCTs will need to do surveys near the A20 penetration once beam is introduced into the AGS.

A review before polarized protons are injected is required to see if additional fault studies are warranted. **(CK-protons-AGS-FY2005-409)**

The AGS shutter has been relocated to J15. Previously the shutter was a vacuum value. The new shutter is now not part of the vacuum system. It also has an observation port for inspection in case the shutter is hit with high intensity beam. The purpose of the shutter is to ensure that there is no beam stored in the AGS. L. Ahrens provided details of the relocation (see attachment 2). The shielding in the J15 section is substantial and the nearest penetration is J18. Downstream penetrations and weak shielding near the B fan house have been examined in fault study (AGS FS no. 15) and for 10**14 protons at 1.5 GeV would have a dose of 2 mrem (fan house) and 7 mrem(escape hatch). These areas are locked. The valve for this fault study was K3 and is much closer. The area looks acceptable for potential dose external to the ring. A dose measurement at the J18 penetration should be made the first time the shutter is used for diagnostic studies. **(Ck-AGS-FY2005-410)**

The shutter will drop into the AGS aperture if the security of an area is broken, where a person could receive more than 100 mrem from a single cycle of the AGS beam. The shutter insertion can be delayed on the order of one cycle (3-5 seconds) since no substantial entry into an area can be made in such a short time. The shutter is not expected to see any beam under normal operations as the injected beam will be interlocked before the shutter enters the machine aperture. The interlocks for the shutter are not dual. It is requested the need for dual interlocks be examined **(CK-FY2005-AGS-411)**

At present we have been assuming that the beam can be stored indefinitely. If an appropriate lifetime of the beam in the ring can be provided to the committee, than this can be folded into the analysis.

It has been requested that the shutter be used for injection energy studies. In this operation, the shutter would prevent inject beam from circulating. A calculation of the potential for soil activation must be done to establish an administrative limit to the amount of beam allowed to hit the shutter in studies. **(CK-AGS-FY2005-412)**

The interlocks do not allow beam to be injected unless the shutter is withdrawn. For injection studies a switch in the interlocks will allow the shutter to remain in the beam aperture with beam being injected. A procedure must be written for this operation and track the administrative limit of beam into the shutter. **(CK-AGS-fy2005-413)**

An engineering evaluation should be conducted to ensure that the shutter will not be damaged by high intensity operations or an inspection process developed if it is hit with high intensity. **(CK-AGS-FY2004-414)**

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